



The Global Exploration Roadmap

Overview and Development Status

**NAC Exploration Committee, Public Meeting
April 26, 2011**

ESMD/Kathy Laurini



- ◆ **What is the Global Exploration Roadmap?**
- ◆ **Global Exploration Roadmap (GER) Development Approach**
- ◆ **Insight into content of the First Iteration**
- ◆ **Schedule**
- ◆ **Summary**

What is The Global Exploration Roadmap?



◆ A tool developed by space agencies to facilitate enhanced coordination and cooperation of global human space exploration activities

- Two Major Thrusts – both technical:
 - Collaboratively develop a long range international strategy(s) for human exploration beyond LEO
 - Reflecting and integrating established agency policies and plans
 - Facilitate identification of near term coordination and cooperation opportunities in 5 areas
 - Use of ISS, robotic missions, infrastructure elements, technologies and terrestrial analogs

◆ A non-binding product (document) of the International Space Exploration Coordination Group (ISECG)

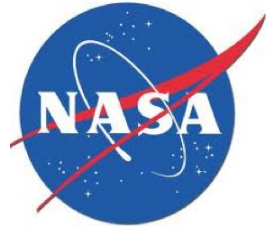
- Senior Agency Managers (AA level) agreed to begin development in June 2010
 - GER development planning reviewed with senior managers November 2010
- Initial release planned for mid-2011
- 11 space agencies have contributed to its development



- ◆ **Work collectively in a non-binding, consensus-driven manner towards the further development and implementation of the Global Exploration Strategy**
 - Providing a forum for discussion of interests, objectives and plans
 - Providing a forum for development of conceptual products
 - Promoting interest and engagement around the world
 - Enabling multilateral or bilateral partnerships
- ◆ **Principles**
 - Open and Inclusive
 - Flexible and Evolutionary
 - Effective
 - Mutual Interest
- ◆ **Focus work on products considered important to enabling timely individual agency decision-making**
- ◆ **Interested agencies plan, organize and perform work in working groups**



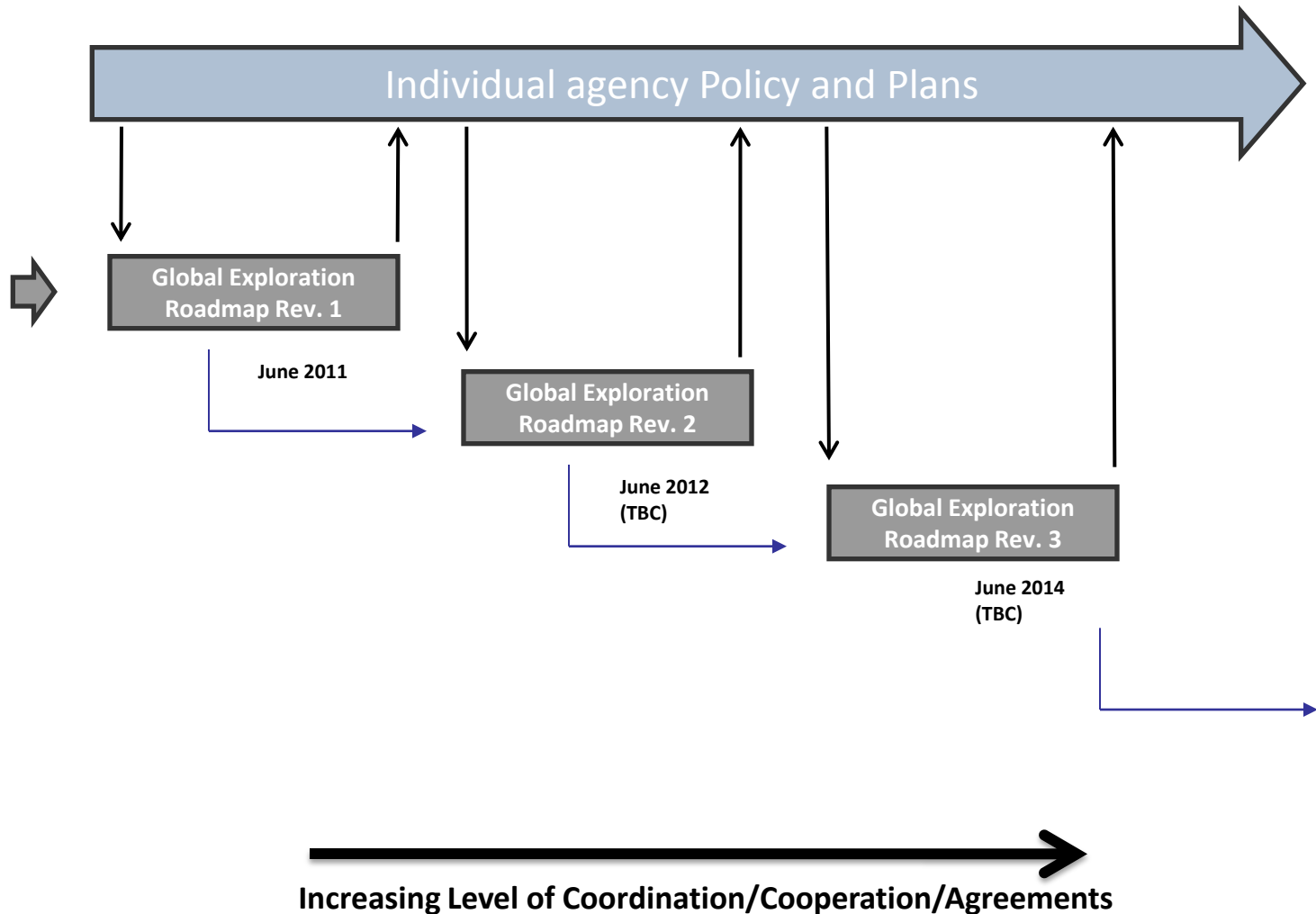
ISECG Agencies Participating in the GER Development



- ◆ ***The Global Exploration Strategy: A Framework for Coordination*** was documented in 2007 by 14 space agencies
- ◆ Vision is for a globally coordinated and sustainable human and robotic space exploration effort to destinations that humans will someday live and work
- ◆ **Delivering benefits in 5 thematic areas:**
 - Science and Technology
 - Sustained Presence in the Solar System
 - Economic Expansion
 - Global Partnerships
 - Inspiration and Education
- ◆ **Envisioned a coordination mechanism to promote the vision**
 - International Space Exploration Coordination Group (ISECG)



The GER Provides a Technical Basis for Informing Policy and Plans



Human Space Exploration Destinations



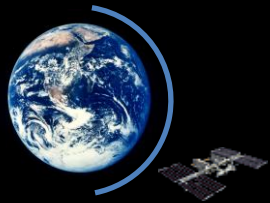
The Moon



LLO

Cis-Lunar Space

HEO, GEO, EML1, EML2

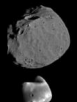


LEO & ISS

NEAs



Mars



Phobos/Deimos

Global Exploration Roadmap Development Approach



◆ Exchange information on current programs/plans

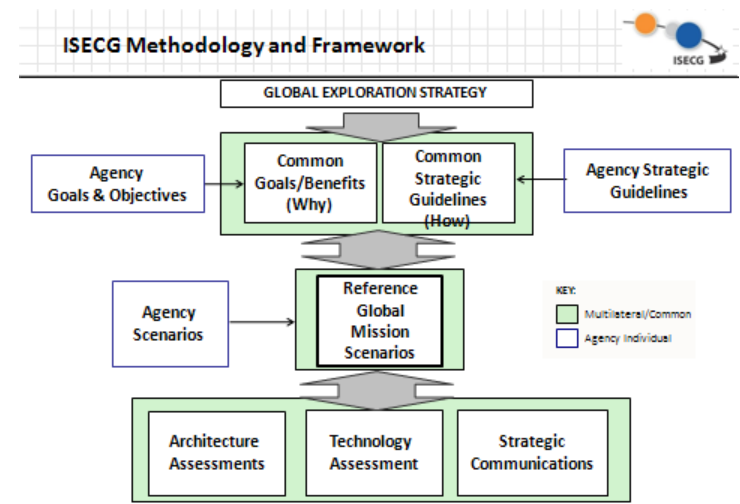
- Goals and objectives, strategic considerations
- Studies of architectures, conceptual missions, needed capabilities
 - NASA inputs informed by HEFT
- Exploration-related ongoing activities and future plans

◆ Advance long range strategies

- Analyze goals and objectives, strategic considerations looking for commonality
- Exploring mission scenarios (focus on after 2020) to reflect commonality

◆ Advance near term coordination and cooperation opportunities

- Identification of key areas for near term partnerships
- Enabling technical expert dialog



The Global Exploration Roadmap: 2011 Planned Document Contents



- ◆ **Introduction and Purpose**
- ◆ **Goals, Objectives and Benefits of Space Exploration**
- ◆ **Agency Activities and Plans**
 - Use of ISS for Exploration
 - Robotic missions to moon, asteroids, Mars
 - Technology investments
 - Infrastructure investments
 - Terrestrial Analog Activities
- ◆ **Long Range Human Exploration Strategies**
- ◆ **An integrated “Global Exploration Roadmap”**
- ◆ **Informing Next Steps**
- ◆ **Conclusion**



- ◆ **Space exploration should be driven by goals and objectives**
 - Current focus is on goals and objectives which guide GER work
 - Achievement of goals and objectives must deliver significant benefits to our global stakeholder community
- ◆ **Common goals and objectives should enable individual agencies to meet their objectives**
- ◆ **NASA inputs derived from/aligned with the NASA Strategic Plan and informed by input from NASA stakeholders**
- ◆ **Defining goals and objectives and their influence on exploration strategies is an iterative process**
 - Current set of goals and objectives is a starting point, subject to further refinement based on continuous consultation with stakeholders

Space Exploration Themes and Common Goals



◆ Common goals build on the Global Exploration Strategy Themes

- Search for Life
- Extend Human Presence
- Perform Space, Earth, and Applied Science
- Perform Science to Support Human Exploration
- Develop Exploration Technologies and Capabilities
- Stimulate Economic Expansion
- Enhance Earth Safety
- Engage the Public in Exploration

◆ The Global Partnership theme is reflected in strategic principles

- ◆ **Globally, significant investments are being made to prepare for beyond LEO exploration**
- ◆ **Opportunities for additional near term coordination and cooperation are anticipated**
- ◆ **Areas of Interest**
 - Use of ISS for Exploration
 - Robotic Precursor Missions
 - Technologies
 - Capability Development (i.e. transportation systems, in space systems)
 - Terrestrial Analog Activities
- ◆ **GER provides framework for enhanced discussions in these areas, aligned with long term strategy options**

- ◆ **Long range strategies are useful in guiding near term investment priorities**
 - International strategies maximize opportunities for coordinating investments
- ◆ **Based on agreed common principles which drive strategies**
 - Capability driven framework: follow a phased/step-wise approach, building on our capabilities
 - Exploration value: generate public benefits and meet exploration objectives
 - International partnerships: provide early and sustained opportunities for diverse partners
 - Robustness: provide for resilience to technical challenges, common interfaces
 - Affordability: take into account budget constraints
 - Human-robot partnership: Maximize synergy between robotic and human missions
- ◆ **First GER iteration is not a singular long range strategy, nor next destination**
 - Will examine the possible next steps and how investments in capabilities enable them

◆ ISECG Mission Scenarios are used to explore the feasible strategies

- Notional series of conceptual exploration missions, beginning with ISS and leading to Mars
 - Not detailed manifests or fully defined architectures

◆ Benefits of a common long range strategy

- Inform individual agency decision making
- Enable examination of exploration approaches to see how they meet common goals, objectives and strategic principles
- Provide a framework for advancing design reference mission definition
- Inform needed capability requirements

Exploration Test Bed

Advancing Exploration Partnerships

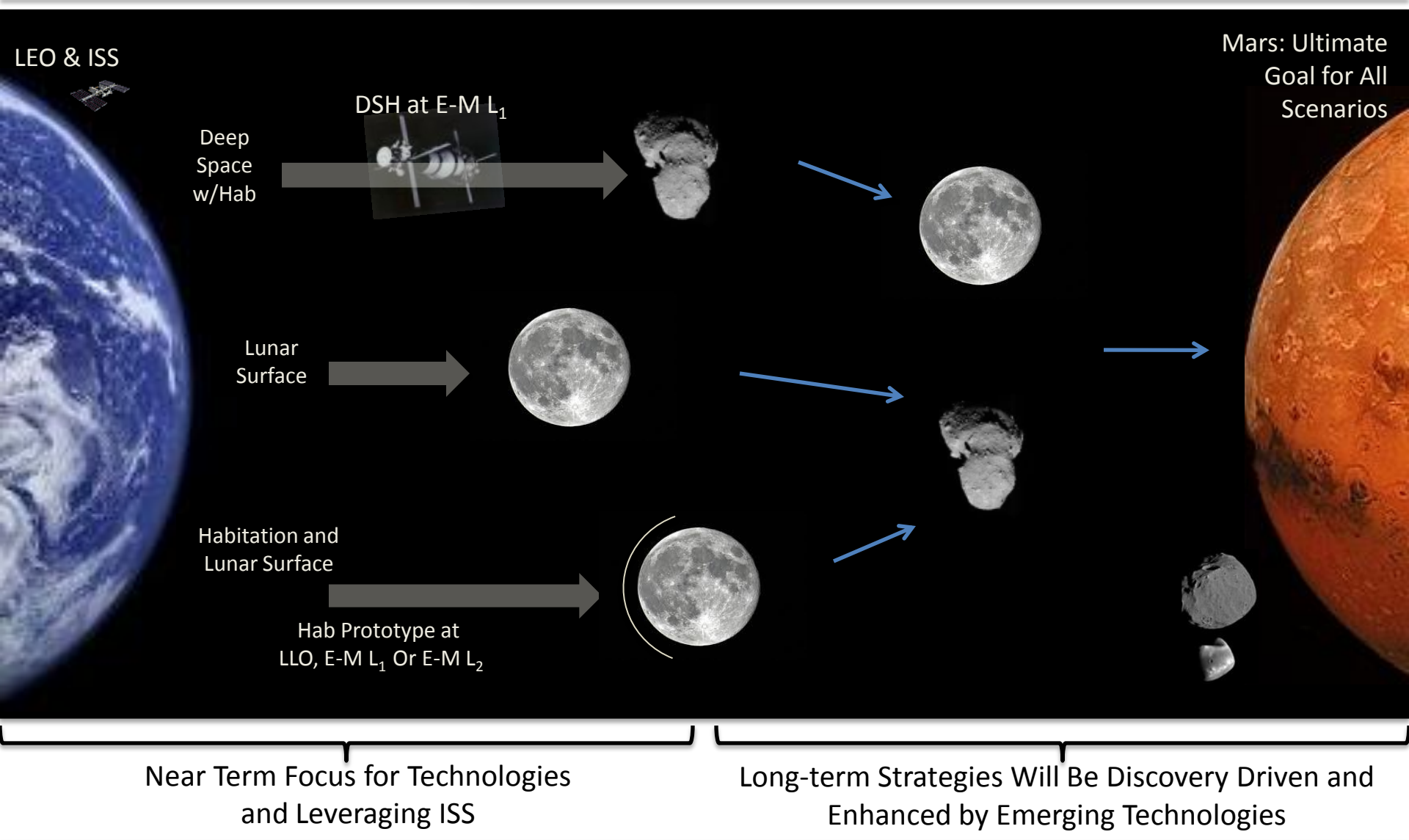
ISS as t

Exploration Human System Risk Mitigations



Space Exploration begins with ISS

Strategies based on Optional Next Steps





◆ Identify 2-3 distinct strategies

- Not point solutions, but will enable broader dialog
 - Multiple ways of implementing any given strategy

◆ Each strategy should

- Show importance of ISS and enable a transition strategy definition
- Enable sustainable human exploration and missions to Mars

- ◆ **GER development process began in June 2010**
 - ISECG meeting at senior manager level
- ◆ **Plan for GER development reviewed in November 2010**
 - 3 ISECG Workshops
 - Topical TIMs identified
- ◆ **Finalization for ISECG senior manager gathering end June in Japan**
- ◆ **GER release soon after ISECG meeting (mid-2011)**
- ◆ **ISECG sponsored stakeholder consultation events envisioned**

- ◆ **Defining and implementing a long range strategy for sustainable human space exploration will be a step wise process involving international dialog at multiple levels**
- ◆ **Such a strategy will be successful if it considers what is technically achievable and what is programmatically implementable**
 - With significant investments in technologies, significant drivers for innovation
- ◆ **Political will and resources are essential**
- ◆ **Agencies contributing to the development of the Global Exploration Roadmap recognize the importance of starting discussions now**

